A DISCUSSION OF NONRESPONSE BIAS STUDIES

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OUTLINE

- **A Brief History**
- **Bias in Perspective**
- **Methods of Studying Nonresponse Bias**
  - **Advantages and Disadvantages**
- **Discussion**

THE BEGINNINGS

- **Statistical agencies formulated standards focusing largely on sampling error, but more recently increasingly recognized the importance of nonresponse bias**
  - **e.g., Census, BLS, NCHS, EIA, NCES**

2006 OMB RELEASES

- **Questions and Answers When Designing Surveys for Information Collections**

- **Standards and Guidelines for Statistical Surveys**

  – **http://www.whitehouse.gov/omb/inforeg_statpolicy/**

AFTER THE RELEASES

- **Education in methods of implementing bias studies**
- **Many nonresponse bias studies conducted for federal surveys**
- **FCSM workshop in 2009 was opportunity to share**

PERSPECTIVE ON BIAS

- **Why does bias matter?**
  - **It affect point estimates directly**
  - **It is largely unaccounted for in statements of the accuracy of the estimates**
  - **Confidence intervals may be fail to cover with prescribed probabilities**

DETERMINISTIC VIEW

$$\overline{Y}_r = \overline{Y}_n + \left(\frac{m}{n}\right)\left[\overline{Y}_r - \overline{Y}_m\right]$$

or

Respondent Mean = Full Sample Mean + Error

where

Error =(NR Rate)*(Resp Mean – NR Mean)

STOCHASTIC VIEW

$$Bias(\overline{y}_r) = \frac{\sigma_{yp}}{\overline{\phi}} = \left(\frac{\rho_{y\phi}}{\overline{\phi}}\right)\sigma_y\sigma_\phi$$

where σ_{yp} = covariance between y and response propensity, ϕ

$\overline{\phi}$ = mean propensity over the sample

$\rho_{y\phi}$ = correlation between y and ϕ

σ_y = standard deviation of y

σ_ϕ = standard deviation of ϕ

ISSUES

- **After OMB releases, some may consider response rates even more important than before because rates <80% trigger nonresponse study.**

- **Nonresponse bias is only one source of error that affects the quality of the estimates. Other errors may be more important in some surveys.**
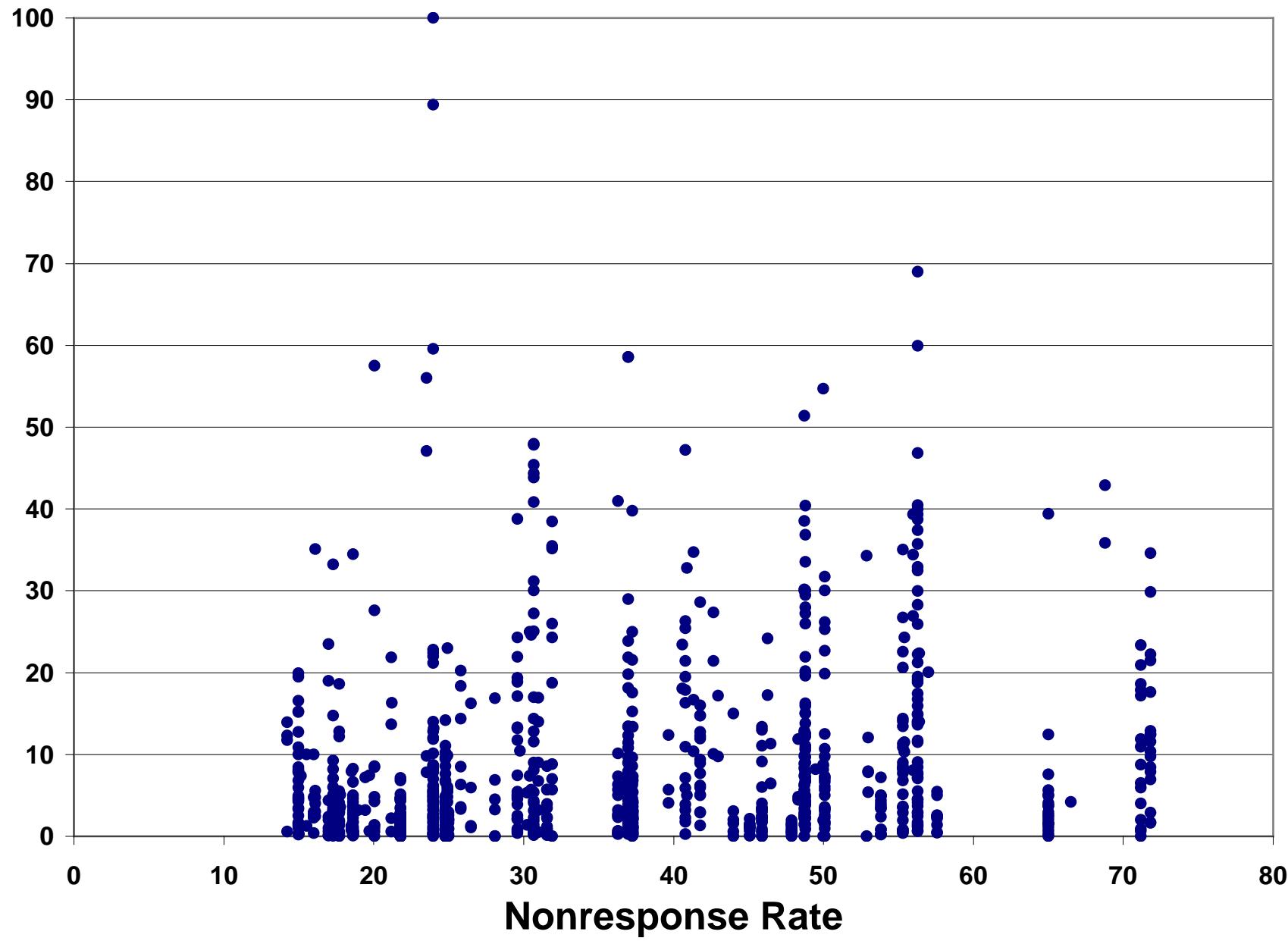
Nonresponse Viewed in the Total Survey Error Perspective

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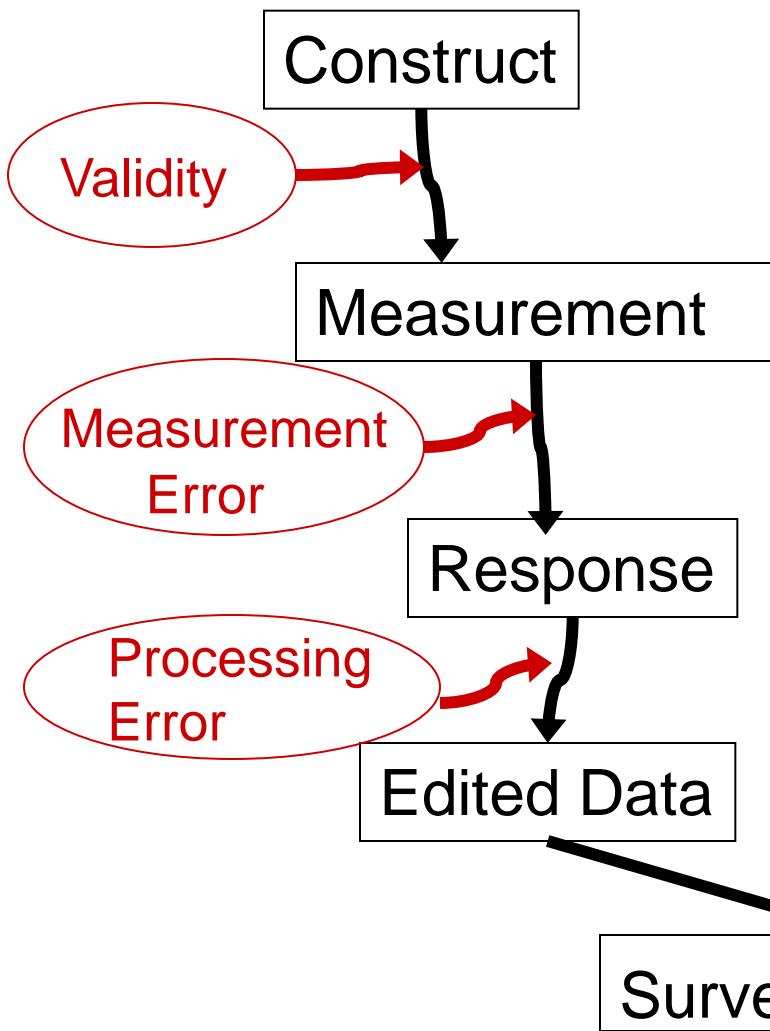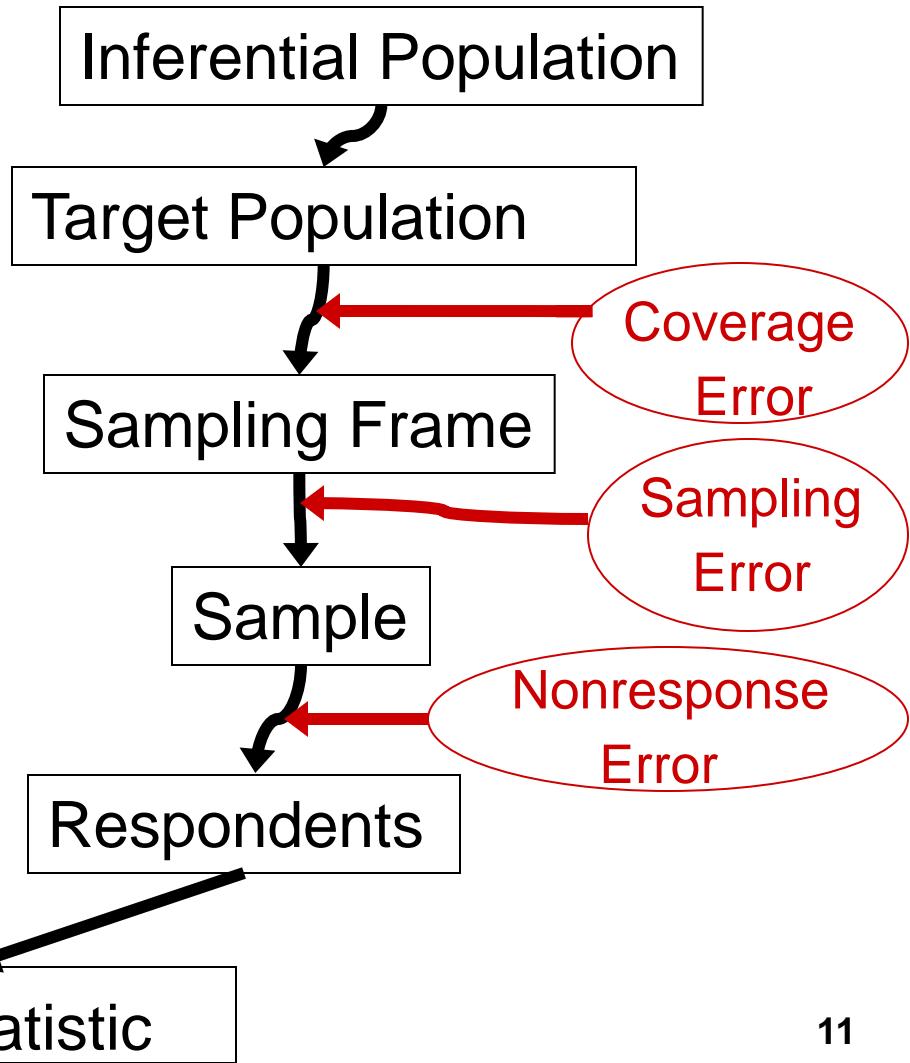
METHODS OF STUDYING BIAS

- Comparing to estimates from other sources

- Computing bias for estimates based on variables available for sampled units

- Studying variation within the respondent set

- Altering the weighting adjustments

BENCHMARKING

- **<u>Final</u> estimates from the survey are compared to estimates from one or more other sources (high response surveys or administrative records) of comparable estimates.**

- **Differences between estimates may be an indicator of nonresponse bias.**

Advantages & Disadvantages Benchmarking Studies

- **Advantages**
  - **Relatively simple and inexpensive**
  - **Comparisons for estimates from survey (final weights)**
  - **Gives an estimate of overall bias**

- **Disadvantages**
  - **Assumes unbiased comparison source (unlikely)**
  - **Differences in the way the survey and comparison source measure variables often largest source of difference**

VARIATION IN SAMPLED UNITS

- **Methods:**
  - **Using frame data**
  - **Matching to other sources**
  - **Collecting observational data**
  - **Seeded sample**

Advantages & Disadvantages Sample Unit Variation

- **Advantages**
  - **Bias is strictly due to nonresponse**
  - **Generally more consistent measurement properties for the variables**
  - **Allows estimation of correlation of propensity to respond and the captured variables**

- **Disadvantages**
  - **Bias estimates are for the frame/matched/observed/seeded variables only**
  - **No bias estimates from final estimates (assumes no nonresponse adjustments)**

VARIATION IN RESPONDING UNITS

- **Methods:**
  - Use of screener data
  - Nonresponse follow-up
  - Two-phase nonresponse follow-up
  - Level of effort
  - Experimental studies

Advantages & Disadvantages Respondent Variation

- **Advantages**
  - **Bias is strictly due to nonresponse**
  - **More consistent measurement properties**
- **Disadvantages**
  - **No bias estimates from final estimates**
  - **Bias estimates are for the screener/1st phase variables only; limits scope of bias studied**
  - **Follow-up may be expensive**
  - **Model assumptions may be tenuous (especially level of effort)**

ALTERING WEIGHTING APPRAOCH

- **Methods:**
  - **Use of hypothetical assumptions**
  - **Weighting based on outcomes**
  - **Weighting based on response propensities**

Advantages & Disadvantages Alternative Weights

- **Advantages**
  - **If good predictors are available, then bias can be evaluated without additional data collection**
  - **Small differences suggest bias may not be large**
- **Disadvantages**
  - **No bias estimates from final estimates**
  - **Failure to find differences may be due to poor correlates or small real bias**
  - **Alternative estimates may be highly dependent on model assumptions or highly variable**

Some Lessons

- **Nonresponse bias can be studied, but response rates predict bias poorly**
- **Consider nonresponse at design stage**
- **Auxiliaries correlated with response *and* key survey variables are critical**
- **All nonresponse bias studies are flawed, but some are useful**
- **Multiple methods are needed**

POSSIBLE DISCUSSION POINTS

1. How much of the survey's resources should be used to address nonresponse bias?

2. Are there better ways to assess the potential for nonresponse bias than simply using the response rate?

3. How informative are the results from nonresponse bias studies

POSSIBLE DISCUSSION POINTS

4. Which multiple methods are best to be used together?

5. How do you design for nonresponse?

6. How do we study the final estimates instead of unadjusted estimates?